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| 09/981,934 | 10/17/2001 | Min-Koo Kim | 678-750 (P9969) | 6314 |

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EXAMINER

TORRES, JOSEPH D

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2133

7

DATE MAILED: 04/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/981,934

Applicant(s)

KIM ET AL.

Examiner

Joseph D. Torres

Art Unit

2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
4a) Of the above claim(s) 1-6 and 13-17 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 7-12 and 18-21 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 17 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group II, claims 7-12 and 18-21 in Paper No. 7 is acknowledged.

Claims 1-6 and 13-17 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

The Examiner notes that the Applicant has included, in the Remark section of the Election in Paper No. 7, a request for claims 1-6 and 13-17 to be cancelled. The Examiner suggests that the Applicant cancel claims 1-6 and 13-17 in a formal amendment.

Information Disclosure Statement

Japanese Office Action (Appln. No. 2002-536786) in the information disclosure statement filed 30 July 2003 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because no English translation of the document was submitted. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement,

including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 ¶ C(1).

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: '607' in Figure 6. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The abstract of the disclosure is objected to because it is replete with grammatical errors, for example; the first sentence has two verbs in the second clause of the first sentence. Correction is required. See MPEP § 608.01(b).

The title of the invention is not descriptive and requires grammatical corrections. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: Apparatus and method for generating punctured constituent sub-codes for a turbo-encoder.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 7-12 and 18-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 7 recites, "puncturing range". Lines 13-15 on page 14 of the Applicant's specification defines "puncturing range" as the size of the puncturing matrix. Nowhere does the Applicant teach what is meant by the size of a matrix, whether the size of the matrix is measured by the number of element making up the rows and columns of the matrix, by the number of columns of the matrix or by the number of rows in the matrix. The Examiner assumes the Applicant intended --number of columns of a puncturing matrix-- in place of "puncturing range" since the number of symbols to be punctured in step 411 of Figure 4 is the number of columns, C.

Claims 8-12 depend from claim 7 hence inherit the deficiencies of claim 7.

Claim 18 recites similar language as in claim 7.

Claims 19-21 depend from claim 18 hence inherit the deficiencies of claim 18.

Claims 7-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not

described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 7 recites, "selecting a predetermined number of symbols from information symbols and first and second parity symbols within a predetermined puncturing range", which the Examiner interprets as --selecting a predetermined number of symbols from information symbols and first and second parity symbols within a predetermined number of columns of a puncturing matrix ~~puncturing range~~--. The Examiner would like to point out that pages 13-14 of the Applicant's specification teaches that first and second parity equations are selected according to equations 3 and 4 on pages 13-14 and not within a predetermined number of columns of a puncturing matrix.

Claims 8-12 depend from claim 7 hence inherit the deficiencies of claim 7.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 7-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors. See following examples:

Claim 7 recites, "selecting a predetermined number of symbols from information symbols and first and second parity symbols within a predetermined puncturing range", which the Examiner interprets as --selecting a predetermined number of symbols from information symbols and first and second parity symbols within a predetermined number of columns of a puncturing matrix ~~puncturing range~~--. The Examiner would like to point out that it is not clear whether the "predetermined number of symbols" is within the "predetermined puncturing range" or whether the "information symbols and first and second parity symbols" are within the "predetermined puncturing range". The Examiner would like to point out the various interpretations for the limitation: --selecting a predetermined number of symbols within a predetermined number of columns of a puncturing matrix from information symbols and first and second parity symbols ~~within a predetermined puncturing range~~--, or --selecting a predetermined number of symbols from information symbols and first and second parity symbols whereby information symbols and first and second parity symbols are within a predetermined number of columns of a puncturing matrix --. The Examiner assumes the following was intended: -selecting a predetermined number of symbols within a predetermined number of columns of a puncturing matrix from information symbols and first and second parity symbols ~~within a predetermined puncturing range~~--.

Claim 7 recites the limitation "the puncturing range" in line 8. There is insufficient antecedent basis for this limitation in the claim.

Claim 7 recites; "selecting all the information symbols within the puncturing range, if a difference between N_s and a number of the information symbols is equal to or greater

than a number of component encoders in the turbo encoder". "a number of the information symbols" is an arbitrary number and can always be selected so that the statement is always true, hence the limitation "if a difference between N_s and a number of the information symbols is equal to or greater than a number of component encoders in the turbo encoder" fails to further limit the claim. Note: since "a number of the information symbols" is an arbitrary number so is the difference.

Claim 9 recites the limitation "unselected first and second parity symbols" in line 2.

There is insufficient antecedent basis for this limitation in the claim. Note: it is not clear where the "unselected first and second parity symbols" come from.

Claims 8-12 depend from claim 7 hence inherit the deficiencies of claim 7.

Claim 10 depends from claim 9 hence inherit the deficiencies of claim 9.

6. Claims 7-12 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. Claim 7 recites, "selecting a predetermined number of symbols from information symbols and first and second parity symbols within a predetermined puncturing range. The omitted structural cooperative relationships are: the relationship between "a predetermined number of symbols", "first and second parity symbols" and "a predetermined puncturing range".

Claims 8-12 depend from claim 7 hence inherit the deficiencies of claim 7.

Claims 7-12 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. Claim 7 recites; "selecting all the information symbols within the puncturing range, if a difference between N_s and a number of the information symbols is equal to or greater than a number of component encoders in the turbo encoder". The omitted structural cooperative relationships are: the relationship between "a number of the information symbols" and "a difference between N_s ".

Claims 8-12 depend from claim 7 hence inherit the deficiencies of claim 7.

Claims 18-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 18 recites, "selecting as many first and second parity symbols as a difference between a predetermined number N_s of symbols to be selected and a number of the information symbols within the predetermined puncturing range". It is not clear what falls within "the predetermined puncturing range": "first and second parity symbols", "a number of the information symbols" or first and second parity symbols separately. In addition, "a predetermined number N_s of symbols to be selected" and "a number of the information symbols" are arbitrary and can be any number; hence so can the difference.

Claim 20 is incomprehensible. In particular, it is unclear what relationship the last sub-code has with first and second sub-codes. Furthermore; unselected first and second

parity symbols have nothing to do with first and second sub-codes since they were not selected for first and second sub-codes.

Claim 20 recites the limitation "unselected first and second parity symbols" in line 2.

There is insufficient antecedent basis for this limitation in the claim. Note: it is not clear where the "unselected first and second parity symbols" come from nor what they refer to.

Claims 19-21 depend from claim 18 hence inherit the deficiencies of claim 18.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 7-10, 12 and 18-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Yi; Byung Kwan (US 5978365 A).

35 U.S.C. 102(b) rejection of claim 7.

Yi teaches a method of generating a first sub-code to be transmitted by selecting a predetermined number of symbols within a predetermined number of columns of a puncturing matrix from information symbols and first and second parity symbols ~~within a predetermined puncturing range~~ (Mux 604 in Figure 7 in Yi selects 2 information symbols which is within the number of columns of puncturing matrix #1 and also selects

2 parity symbols from the first and second parity symbols which is also within the number of columns of puncturing matrix #1) in a communication system having a turbo encoder for generating information symbols, first parity symbols, and second parity symbols for the input of an information bit stream (Figure 502 in Figure 5 and 6 of Yi teaches a communication system having a turbo encoder for generating information symbols, first parity symbols, and second parity symbols for the input of an information bit stream), the predetermined number of symbols being N_s symbols ($N_s = 2$ since Mux 604 in Figure 7 in Yi selects 2 information symbols which is within the number of columns of puncturing matrix #1 and also selects 2 parity symbols from the first and second parity symbols which is also within the number of columns of puncturing matrix #1), comprising the steps of: selecting all the information symbols within the puncturing range, if a difference between N_s and a number of the information symbols is equal to or greater than a number of component encoders in the turbo encoder (In Figure 7 of Yi the total number of symbols produced in a cycle is a "number of the information symbols", is equal to 4 and $4 - N_s = 2$ is equal to or greater than the number of component encoders of Figure 6 in Yi); and selecting as many first and second parity symbols as the difference, a number of the selected first parity symbols being equal to or greater than a number of the selected second parity symbols (Mux 604 in Figure 7 in Yi selects 2 parity symbols in one cycle a number of the selected first parity symbols being equal to or greater than a number of the selected second parity symbols).

35 U.S.C. 102(b) rejection of claim 8.

Yi teaches increasing the puncturing range by an integer multiple if the difference is less than the number of the component encoders (Note: the difference is an arbitrary number as pointed out above and if both puncturing matrices in Figure 7 of Yi are used, the number of columns is 4).

35 U.S.C. 102(b) rejection of claim 9.

Yi teaches selecting the $N_s=2$ symbols from unselected first and second parity symbols in the first sub-code in generating a second sub-code (MUX 605 in Figure 7 of Yi selects $N_s=2$ symbols from unselected first and second parity symbols in the first sub-code in generating a second sub-code), wherein the number of the selected first parity symbols is equal to or greater than the number of the selected second parity symbols (in Figure 7 of Yi the number of the selected first parity symbols is equal to or greater than the number of the selected second parity symbols).

35 U.S.C. 102(b) rejection of claim 10.

$N_{s2}=2$ in Figure 7 since 2 symbols are left unselected in every two cycles of the multiplexer from 4 cycles of the Puncturer. $N_{s2}-N_s=2-2=0$ and none of the systematic information bits are repeated.

35 U.S.C. 102(b) rejection of claim 12.

$N_s=2$, $C=2$ (for puncturing matrix #1 in Figure 7 in Yi) and $R_{max}=1/2$; hence $N_s=(C/(2*R_{max}))$, that is; N_s can be determined by C and R_{max} .

35 U.S.C. 102(b) rejection of claim 18.

Yi teaches an apparatus for generating a sub-code in a communication system (Figure 6 in Yi is an apparatus for generating a sub-code in a communication system), comprising: a turbo encoder for encoding an input information bit stream with a given code rate and generating information symbols, first parity symbols, and second parity symbols (turbo encoder 502 in Figure 5 and 6 of Yi is an apparatus for encoding an input information bit stream d_k with a given code rate $1/2$ and generating information symbols X_1 and X_2 , first parity symbols, Y_1 , and second parity symbols, Y_2); and a sub-code generator for generating a first sub-code to be transmitted by selecting all information symbols within a number of columns of a puncturing matrix puncturing range (Figure 7 of Yi teaches 2 information symbols are chosen by Puncturing Matrix #1 every 2 cycles which is the number of columns of the Puncturing Matrix 1; hence Yi teaches a sub-code generator MUX 604 for generating a first sub-code to be transmitted by selecting all information symbols every two cycles within a number of columns of a puncturing matrix puncturing range) and selecting as many first and second parity symbols as a difference between a predetermined number N_s of symbols to be selected and a number of the information symbols within the predetermined puncturing range (4 symbols are selected by MUX 604 in Figure 7 every two cycles hence are a predetermined number $N_s=4$ of symbols to be selected; 2 information symbols are selected by MUX 604 in Figure 7 every two cycles hence are a number of the information symbols within the predetermined puncturing range; $2 = N_s - 2 = 4 - 2$ is the

number of first and second parity symbols selected by MUX 604 in Figure 7 of Yi every two cycles), a number of the selected first parity symbols being equal to or greater than a number of the selected second parity symbols (the number of first parity symbols selected every 4 cycles is equal to or greater than the number of second parity symbols selected every 4 cycles), if the difference is equal to or greater than a number of component encoders in the turbo encoder (the difference is equal to 2 and is equal to or greater than a number of component encoders in the turbo encoder).

35 U.S.C. 102(b) rejection of claims 19 and 20.

Yi teaches the sub-code generator MUX 605 in Figure 7 of Yi generates a second sub-code by selecting $N_s=2$ symbols from the first and second parity symbols every two cycles without selecting information symbols (Note: on the second cycle only parity symbols are selected), the number of the selected first parity symbols being equal to or greater than the number of the selected second parity symbols (the number of first parity symbols selected every 4 cycles is equal to or greater than the number of second parity symbols selected every 4 cycles).

35 U.S.C. 102(b) rejection of claim 21.

Yi teaches increasing the puncturing range by an integer multiple if the difference is less than the number of the component encoders (Note: the difference is an arbitrary number as pointed out above and if both puncturing matrices in Figure 7 of Yi are used, the number of columns is 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
8. Claims 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yi; Byung Kwan (US 5978365 A) in view of Rowitch et al. (Rowitch, D.N.; Milstein, L.B.; On the performance of hybrid FEC/ARQ systems using rate compatible punctured turbo (RCPT) codes, IEEE Transactions on Communications, Volume: 48, Issue: 6, June 2000, Pages: 948 – 959; Note: hereafter referred to as Rowitch).

35 U.S.C. 103(a) rejection of claim 11.

Yi substantially teaches the claimed invention described in claims 7-10 (as rejected above).

However Yi does not explicitly teach the specific use of an ARQ protocol.

Rowitch, in an analogous art, teaches the use of Rate compatible punctured Turbo codes in a hybrid FEC/ARQ protocol. ARQ protocols are some of the most common protocols used in data communications for ensuring data integrity. One of ordinary skill in the art at the time the invention was made would have been highly motivated to use an ARQ protocol in a transmission system whenever errors periodically exceed the error correction capabilities of a given FEC code to ensure the integrity of user data.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yi with the teachings of Rowitch by including use of an ARQ protocol. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of an ARQ protocol would have provided the opportunity to ensure the integrity of user data even when errors periodically exceed the error correction capabilities of a given FEC code.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tong; Wen et al. (US 6665833 B1) teaches parallel concatenated convolutional codes (PCCCs) or so-called turbo codes, for code rate conversion or rate matching. Li; Jifeng (US 6519732 B1) teaches an error-correcting encoding apparatus including convolution units provided in parallel with each other. Acikel, O.F.; Ryan, W.E.; High rate turbo codes for BPSK/QPSK channels, Conference Record IEEE International Conference on Communications, Volume: 1, 7-11 June 1998, Pages: 422 -

427. Acikel, O.F.; Ryan, W.E.; Punctured turbo-codes for BPSK/QPSK channels, IEEE Transactions on Communications, Volume: 47, Issue: 9, Sept. 1999, Pages: 1315 – 1323.

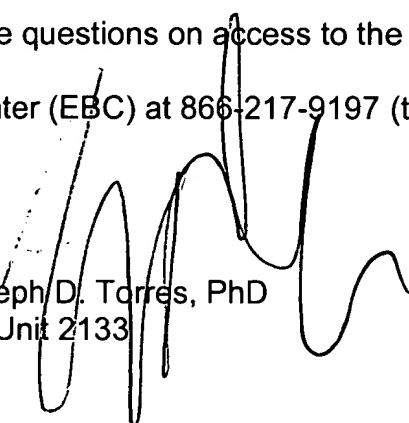
Shidong Zhou; Yan Yao; High rate turbo code using unevenly punctured convolutional constituent code, Fifth Asia-Pacific Conference on Communications and Fourth Optoelectronics and Communications Conference, Volume: 1, 18-22 Oct. 1999, Pages: 751 - 754.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (703) 308-7066. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2133

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Joseph D. Torres, PhD
Art Unit 2133